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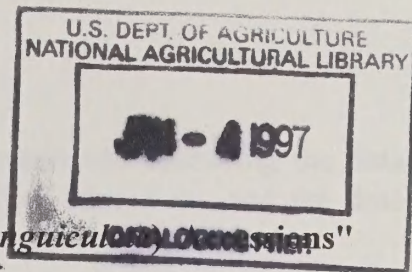
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FINAL REPORT

"Characterization and Multiplication of Cowpea (*Vigna unguiculata* L. Walp.) for 'southern peas' and 'blackeye beans'"

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Agency and Number: USDA ARS Cooperative Agreement 58-6659-1-104, Amendment 1

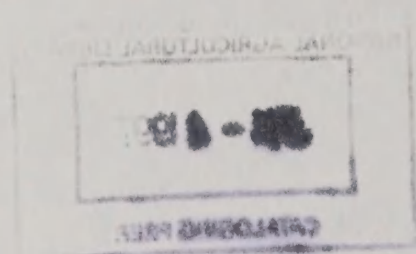
Amount and Period: \$46,000 for 9/15/91 - 9/14/94

Introduction and Justification

Cowpea (*Vigna unguiculata* (L.) Walp.) is grown commercially in the southeastern U.S. for fresh "southern peas", and in the southwestern U.S. to produce dry "blackeye beans". The total area of production is 200,000 acres. In addition, it is a popular crop in home gardens. California is the major international exporter of cowpea dry beans. The world market for cowpea as dry beans could increase several fold in the future, and the southwestern U.S. is well-placed to take advantage of this expanded export market.

The cowpea industries in the U.S. have an array of pest and disease problems that mainly could be solved by breeding resistant cowpea varieties. Cowpea breeding in the U.S. is being conducted by Land Grant Universities and the USDA. These breeding programs require access to an extensive cowpea germplasm collection if they are to obtain parental material with resistance to the various pests and diseases.

The main cowpea germplasm collection in the U.S. is at the USDA, Regional Plant Introduction Station at Griffin, Georgia (USDA PI Station). In 1988 this station had ca. 2,300 accessions with seed available to scientists. The Vigna Crop Advisory Committee of USDA concluded in meetings in 1987 and 1988 that the U.S. collection of cowpea germplasm was too small in relation to the potential future needs of U.S. Agriculture. The International Institute for Tropical Agriculture (IITA) in Nigeria had the only major cowpea germplasm collection in the world, with 14,857 entries listed in their data base as of May 30, 1989. The Vigna Crop Advisory Committee considered that this collection was not readily accessible to U.S. and other scientists and is not secure. In a Final Report for our work under a previous cooperative agreement with USDA ARS (58-43YK-8-0027), we pointed out that 1,000's of the cowpea accessions previously in the IITA collection may have been lost, but the extent of the problem is not known because we have not seen a report from IITA concerning the status of their cowpea collection. Recent serious riots and political disturbances in the region around the IITA headquarters in Ibadan, where the cowpea collection is located, indicate that the major component of the world cowpea collection is in jeopardy and that this precious resource for mankind may be irretrievably lost. The International Board for Plant Genetic Resources has recommended that the IITA cowpea collection should be backed up at the USDA National Seed Storage Laboratory but this has not been done. Under the previous cooperative agreement with USDA we developed a system for propagating and multiplying seed of cowpea accessions that was designed to minimize the extent of contamination by seed-borne viruses.



We also developed a system for characterizing the cowpea accessions and recording the data on a computerized system. We provided seed of 1391 new cowpea accessions and the data base to the USDA PI Station.

A new Specific Cooperative Agreement was made between USDA-ARS and the University of California, Riverside for the purpose of propagating, multiplying and characterizing cowpea accessions, and providing seed and the data base to the USDA PI Station. The amount of this grant was \$40,000 for the period from 9/15/91 through 9/14/93. An extension was granted to 9/14/94 with an additional allocation of \$6,000. This document is the final report on this project.

Objectives of the Project and Results

1a. The original intent was that a "representative core" collection of cowpea germplasm would be developed. Each year, UCR was supposed to enter the passport data and seed characteristics of 3,500 IITA cowpea accessions into a computerized data base and choose 1,250 accessions for propagation based upon eliminating any duplicate entries and reselections from earlier accessions, and taking only 40 % of the accessions from specific geographical regions, and adding unique accessions collected by UCR personnel. However, USDA did not provide us with sufficient numbers of accessions to achieve this goal, which was their responsibility under the agreement. We processed virtually all of the accessions that USDA provided to us and from the UCR collection, eliminating only those that our computerized system showed to be duplicates. It should also be noted that USDA agreed to provide a printed copy of the data base on the characteristics of all accessions in the cowpea germplasm collection at IITA but did not accomplish this. In defense of USDA, I would point out that it is difficult to obtain either seed or information concerning the cowpea germplasm collection from IITA, and this is why this project is so important.

1b. Each winter season for two years, UCR was supposed to propagate 1,250 accessions under prescribed conditions. Using a positive-pressure glasshouse, UCR planted all of the seed provided to us by the USDA PI Station, 1,197 accessions in the winter season of 1991/92 and obtained seed from 1,172 accessions, and 1,184 accessions in the winter season of 1992/93 and obtained seed from 1,126 accessions.

1c. Each summer season for two years, UCR was supposed to multiply approximately 1,200 accessions in a field nursery at Riverside under prescribed conditions. Using field nurseries at Riverside, UCR planted 1,420 accessions in the summer of 1992, 680 accessions in the summer of 1993, and 250 accessions in the summer of 1994. Difficulties were experienced in multiplying seed of accessions with extreme sensitivity to photoperiod at Riverside. UCR planted 100 of these accessions in a field nursery in the Coachella Valley Field Station of the University of California in March 2, 1993 but only 3 accessions flowered. UCR planned to plant 200 photoperiod-sensitive accessions in Coachella Valley in February 1994 but the weather was too cold to achieve plant emergence. We plan to plant these 200 accessions in Coachella Valley in September 1994 and if the multiplication is successful we will send the

seed to USDA at no cost to USDA.

2. Over the life of the project, UCR was supposed to ship to the USDA PI Station about 2 lbs of seed of about 2,000 accessions and a computerized data base. UCR shipped seed of the following accessions and the associated data bases: 377 in 1991, 449 in 1992, 977 in 1993 and 579 in 1994 for a total of 2,382 accessions. In addition, seed from the 1994 summer planting at Riverside and fall planting at Coachella Valley will be sent to USDA at no cost to USDA.

Additional accomplishments not specifically included in the agreement. During 1992, UCR provided the U.S. PI Station with a list of all IITA materials presently in the UCR collection. This should facilitate the importation by USDA of cowpea accessions from IITA that are not currently at either UCR or the USDA PI Station. We added about 400 accessions to the USDA collection from the UCR collection, and provided USDA with seed of 93 lines that had been lost in transit in our work under the previous cooperative agreement. In addition to characterizing accessions for botanical characteristics, we discovered accessions with resistance to the aggressive California biotype of the cowpea aphid, an aggressive biotype of root knot nematode, and a new race (#4) of fusarium wilt, and seedling-stage non-preference resistance to lygus bug.

Summary

Work under this and the previous Specific Cooperative Agreement has enabled the USDA PI Station to develop a significant cowpea germplasm collection and data base. The present U.S. cowpea collection is now about three times larger than it was in 1988 and is the second largest collection in the world after the collection at IITA in Ibadan, Nigeria. This is an important achievement in that the IITA collection is now in serious jeopardy due to riots and political disturbances in the region around Ibadan, and much of the collection may not be backed-up by duplicate samples in other countries.

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